IEC 62055-41

Edition 2.0 2014-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electricity metering – Payment systems – Part 41: Standard transfer specification (STS) – Application layer protocol for one-way token carrier systems

Comptage de l'électricité – Systèmes de paiement – Partie 41: Spécification de transfert normalisé (STS) – Protocole de couche application pour les systèmes de supports de jeton unidirectionnel

IEC 62055-41:2014-05(en-fr)

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CONTENTS

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ELECTRICITY METERING – PAYMENT SYSTEMS –

Part 41: Standard transfer specification (STS) – Application layer protocol for one-way token carrier systems

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62055-41 has been prepared by IEC technical committee 13: Electrical energy measurement and control.

This second edition cancels and replaces the first edition issued in 2007. It constitutes a technical revision. The main technical changes with regard to the previous edition are as follows:

- Class 2 token is extended to include credit transfer for gas and water with associated extensions in the display/test tokens.
- MfrCode is extended from 2 to 4 digits.
- Three token identifier base dates are defined to provide for more frequent key changes with TID roll-over procedures.
- A code of practice for the management of TID roll-over key changes in association with the revised set of base dates.
- Some clarifications and additional examples have been added.

The text of this standard is based on the following documents:

CDV	Report on voting
13/1530/CDV	13/1553/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

A list of all parts in the IEC 62055 series, published under the general title *Electricity metering – Payment systems*, can be found on the IEC website.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

The IEC 62055 series covers payment systems, encompassing the customer information systems, point of sale systems, token carriers, payment meters and the respective interfaces that exist between these entities. At the time of preparation of this standard, IEC 62055 comprised the following parts, under the general title, *Electricity metering – Payment systems:*

Part 21: Framework for standardization

Part 31: Particular requirements – Static payment meters for active energy (classes 1 and 2)

Part 41: Standard transfer specification – Application layer protocol for one-way token carrier systems

Part 51: Standard transfer specification – Physical layer protocol for one-way numeric and magnetic card token carriers

Part 52: Standard transfer specification – Physical layer protocol for a two-way virtual token carrier for direct local connection

Part 4x series specify application layer protocols and Part 5x series specify physical layer protocols.

The standard transfer specification (STS) is a secure message protocol that allows information to be carried between point of sale (POS) equipment and payment meters and it caters for several message types such as credit, configuration control, display and test instructions. It further specifies devices and codes of practice that allow for the secure management (generation, storage, retrieval and transportation) of cryptographic keys used within the system.

The token carrier, which is not specified in this part of IEC 62055, is the physical device or medium used to transport the information from the POS equipment to the payment meter. Three types of token carriers are currently specified in IEC 62055-51 and IEC 62055-52; the magnetic card, the numeric token carrier and a virtual token carrier, which have been approved by the STS Association. New token carriers can be proposed as new work items through the National Committees or through the STS Association.

Although the main implementation of the STS is in the electricity supply industry, it inherently provides for the management of other utility services such as water and gas. It should be noted that certain functionalities may not apply across all utility services, for example, MaximumPowerLimit in the case of a water meter. Similarly, certain terminology may not be appropriate in non-electrical applications, for example, Load Switch in the case of a gas meter. Future revisions of the STS may allow for other token carrier technologies like smart cards and memory keys with two-way functionality and to cater for a real-time clock and complex tariffs in the payment meter.

Not all the requirements specified in this standard are compulsory for implementation in a particular system configuration and as a guideline, a selection of optional configuration parameters are listed in Clause C.11.

The STS Association is registered with the IEC as a Registration Authority for providing maintenance services in support of the STS (see Clause C.1 for more information).

Publication of IEC 62055-41 Ed 1 in May 2007 resulted in its rapid adoption as the preferred global standard for prepayment meters in many IEC member countries and a majority of IEC affiliate member countries. Prepayment electricity meters and their associated Payment Systems are now produced, operated and maintained by an ecosystem of utilities, meter manufacturers, meter operators, vending system providers, vending agents, banking institutions and adjacent industries. Multi-stakeholder interests are served by the STS Association comprising of more than 130 organisations located in over 24 countries. Interoperability and conformance to the Standard Transfer System (STS) are guaranteed by

Conformance test specifications developed and administered by the STS Association. A full list of the STS Association services can be found at http://www.sts.org.za.

Developed originally for prepayment electricity meters in Africa – via an IEC TC13 WG15 D-type liaison with the STS Association – this IEC standard now serves more users in Asia than Africa, with a total of approximately 35 million meters operated by 400 utilities in 30 countries. Management of the technology has been administered by the STS Association in fulfilment of its role as the IEC appointed Registration Authority.

Global success has brought about an urgent need to extend the range of the numerical elements contained in IEC 62055-41 tables. In particular, the range of manufacturer numbers need to be extended beyond the 99 numbers originally provided. Also, application of the standard has been extended to cater for multi-energy systems including gas and water meters. Accordingly, there is a need to ensure that the content of IEC 62055-41 is maintained to cater for this market growth and multi-energy extensions.

Several corrections and clarifications are also required to bring Ed 1 up to date with current practice. This was considered by TC13 WG15 at its meeting on the 20 September 2012 in London, where it was agreed that IEC 62055-41 should be revised.

Only the most urgently required revisions have been incorporated in Edition 2 due to timing constraints, but it is anticipated that Edition 3 will consider further revisions to incorporate the following functionalities:

- Currency transfer
- Enhanced security on par with contemporary industry practice
- Complex functions fully harmonized with DLMS/COSEM suite
- Decentralized key management system with distributed architecture
- Conformance certification test suite in conjunction with IECEE CB scheme

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning special reserved token identifier given in 6.3.5.2.

IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured the IEC that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from:

Address: Itron Measurement and Systems, P.O. Box 4059,TygerValley 7536, Republic of South Africa
Tel: +27 21 928 1700
Fax: +27 21 928 1701
Website: http://www.itron.com

Address: Conlog (Pty) Ltd, P.O. Box 2332, Durban 4000, Republic of South Africa
Tel: +27 31 2681141
Fax: +27 31 2087790
Website: http://www.conlog.co.za

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ISO (www.iso.org/patents) and IEC (http://patents.iec.ch) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this International Standard may involve the use of a maintenance service concerning encryption key management and the stack of protocols on which the present International Standard IEC 62055-41 is based [see Clause C.1.] The IEC takes no position concerning the evidence, validity and scope of this maintenance service.

The provider of the maintenance service has assured the IEC that he is willing to provide services under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the provider of the maintenance service is registered with the IEC. Information may be obtained from:

Address: The STS Association, P.O. Box 868, Ferndale 2160, Republic of South Africa

Tel: +27 11 061 5000

Fax: +27 86 679 4500

Email: sts@vdw.co.za

Website: http://www.sts.org.za

ELECTRICITY METERING – PAYMENT SYSTEMS –

Part 41: Standard transfer specification (STS) – Application layer protocol for one-way token carrier systems

1 Scope

This part of IEC 62055 specifies the application layer protocol of the STS for transferring units of credit and other management information from a point of sale (POS) system to an STS-compliant payment meter in a one-way token carrier system. It is primarily intended for application with electricity payment meters without a tariff employing energy-based tokens, but may also have application with currency-based token systems and for services other than electricity.

It specifies:

- a POS to token carrier interface structured with an application layer protocol and a physical layer protocol using the OSI model as reference;
- tokens for the application layer protocol to transfer the various messages from the POS to the payment meter;
- security functions and processes in the application layer protocol such as the Standard Transfer Algorithm and the Data Encryption Algorithm, including the generation and distribution of the associated cryptographic keys;
- security functions and processes in the application layer protocol at the payment meter such as decryption algorithms, token authentication, validation and cancellation;
- specific requirements for the meter application process in response to tokens received;
- a scheme for dealing with payment meter functionality in the meter application process and associated companion specifications;
- generic requirements for an STS-compliant key management system;
- guidelines for a key management system;
- entities and identifiers used in an STS system;
- code of practice for the management of TID roll-over key changes in association with the revised set of base dates;
- code of practice and maintenance support services from the STS Association.

It is intended for use by manufacturers of payment meters that have to accept tokens that comply with the STS and also by manufacturers of POS systems that have to produce STS-compliant tokens and is to be read in conjunction with IEC 62055-5x series.

STS-compliant products are required to comply with selective parts of this International Standard only, which is the subject of the purchase contract (see also Clause C.11).

NOTE Although developed for payment systems for electricity, the standard also makes provision for tokens used in other utility services, such as water and gas.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>)

IEC 62051:1999, *Electricity metering – Glossary of terms*

IEC 62055-21:2005, *Electricity metering – Payment systems – Part 21: Framework for standardization*

IEC 62055-31:2005, *Electricity metering – Payment systems – Part 31: Particular requirements – Static payment meters for active energy (classes 1 and 2)*

IEC 62055-51:2007, *Electricity metering – Payment systems – Part 51: Standard transfer specification (STS) – Physical layer protocol for one-way numeric and magnetic card token carriers*

IEC 62055-52:2008, *Electricity metering – Payment systems – Part 52: Standard transfer specification (STS) – Physical layer protocol for a two-way virtual token carrier for direct local connection*

ISO/IEC 7812-1:2006, *Identification cards – Identification of issuers – Part 1: Numbering system*

ISO/IEC 7812-2:2007, *Identification cards – Identification of issuers – Part 2: Application and registration procedures*

ANSI X3.92-1981, *American National Standard Data Encryption Algorithm, American National Standards Institute – Data Encryption Algorithm*

FIPS PUB 46-3:1999, *Federal Information Processing Standards Publication – Data Encryption Standard*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050, IEC 62051, IEC 62055-31 as well as the following apply.

NOTE Where there is a difference between the definitions in this standard and those contained in other referenced IEC standards, then those defined in this standard take precedence.

The term “meter” is used interchangeably with “payment meter”, “prepayment meter” and “decoder”, where the decoder is a sub-part of an electricity payment meter or a multi-part payment meter.

The term “POS” is used synonymously with “CIS”, “MIS” and “HHU” in the sense that tokens may also be generated by, and transferred between these entities and the payment meter.

The term “utility” is used to signify the supplier of the service in a general sense. In the liberalized markets the actual contracting party acting as the “supplier” of the service to the consumer may not be the traditional utility as such, but may be a third service provider party.

3.1.1
companion specification
specification managed by the STS Association, which defines a specific instance of a MeterFunctionObject (see 5.5 and Clause C.8)